Android Based Switching of Electrical Appliances as Smart Electricity

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Abstract:

This project presents the overall design of Home Automation System (HAS) with low cost and wireless system. This system is designed to assist and provide support in order to fulfill the needs of elderly and disabled in home. The switch modes are used to control the home appliance. The main control system implements wireless technology to provide remote access from smart phone. The design remains the existing electrical switches and provides more safety control on the switches with low voltage activating method. The switches status is synchronized in all the control system whereby every user interface indicates the real time existing switches status. The system intended to control electrical appliances and devices in house with relatively low cost design, user-friendly interface and ease of installation.

Keywords: Android, appliances switching, home automation, Arduino, Bluetooth etc.

INTRODUCTION:

The concept of home automation has been around since the late 1970s. But with the advancement of technology and services, people's expectations of what a home should do or how the services should be provided and accessed at home has changed a lot during the course of time, and so has the idea of home automation systems. In this paper we introduce Internet of Things based smart switching System which provides a low cost, user friendly, smart home. It uses an Android application which provides Switching functionalities, where the Electrical/Electronic appliances can be monitored and controlled remotely. This System eliminates use of traditional personal computers (PC) and its peripheral devices, which provides easy mobility.

The "Smart Switching" concept has existed for many years. The terms "Smart Home", "Intelligent Home" followed and has been used to introduce the concept of networking appliances and devices in the house. Smart Switching Systems (SSS) represents a great research opportunity in creating new fields in engineering, and Computing. SSS includes centralized control of lighting, appliances, security locks of gates and doors and other systems, to provide improved comfort, energy efficiency and security system. SSS becoming popular nowadays and enter quickly in this emerging market. However, end users, especially the disabled and elderly due to their complexity and cost, do not always accept these systems. Due to the advancement of wireless technology, there are several different of connections are introduced such as GSM, and Bluetooth. Each of the connection has their own unique specifications and applications. Among the four popular wireless connections that often implemented in HAS project, BLUETOOTH is being chosen with its suitable capability. The capabilities of BLUETOOTH are more than enough to be implemented in the design. Also, most of the current laptop/notebook or Smartphone come with built-in BLUETOOTH adapter. It will indirectly reduce the cost of this system.

This project forwards the design of Smart Switching and security system using ArduinoNano, a credit sized computer. ArduinoNano provides the features of a mini computer, additional with its GPIO pins where other components and devices can be connected. GPIO registers of ArduinoNano are used for the output purposes. We have design a power strip that can be easily connected to GPIO Pins of the ArduinoNano. The home appliances are connected to the input/output ports of ArduinoNano along with the power strip and their status is passed to the ArduinoNano. The android running OS in any phone connected to a network can access the status of the home appliances via an application. It presents the design and implementation of automation system that can monitor and control home appliances via android phone or tablet.

OBJECTIVES:

This project presents the overall design of smart switching System with low cost and wireless system. This system is designed to assist and provide support in order to full fill the needs of elderly and disabled in home. The switch mode are used to control the home appliance. The main control system implements wireless technology to provide remote access from smart phone. The design remains the existing electrical switches and provides more safety control on the switches with low voltage activating method. The system intended to control electrical appliances and devices in house with relatively low cost design, user-friendly interface and ease of installation.

Controlling Home Appliances via Application-
To develop an application that includes the features of switches. Switch Mode can be used to control the switches of home appliances.
Secure Connection Channels between Application and arduinonano–
Use of secure protocols over Bluetooth so that other devices cannot control the appliances. Options for secure connection is SSL over TCP, SSH
Controlled by any device capable of bluetooth-

To make the home appliances flexible in control, any device capable of bluetooth connectivity will able to control the home appliances from remote location.
Extensible platform for future enhancement-
The application is to be highly extensible, with possibility of adding features in the future as needed.

LITERATUREREVIEW:

1. Bluetooth based home automation system using cell phone [1].
R.Piyare, M.Tazil
Technology is a never ending process. To be able to design a product using the current technology that will be beneficial to the lives of others is a huge contribution to the community. This paper presents the design and implementation of a low cost but yet flexible and secure cell phone based home automation system. The design is based on a standalone Arduino BT board and the home appliances are connected to the input/ output ports of this board via relays. The communication between the cell phone and the Arduino BT board is wireless. This system is designed to be low cost and scalable allowing variety of devices to be controlled with minimum changes to its core. Password protection is being used to only allow authorised users from accessing the appliances at home.

2. Bluetooth Remote Home Automation System Using Android Application [2]. R.A.Ramlee et.al.
This paper presents the overall design of Home Automation System (HAS) with low cost and wireless remote control. This system is designed to assist and provide support in order to fulfill the needs of elderly and disabled in home. Also, the smart home concept in the system improves the standard living at home. The main control system implements wireless Bluetooth technology to provide remote access from PC/laptop or smart phone. The design remains the existing electrical switches and provides more safety control on the switches with low voltage activating method. The switches status is synchronized in all the control system whereby every user interface indicates the real time existing switches status. The system intended to control

electrical appliances and devices in house with relatively low cost design, user-friendly interface and ease of installation.

3. Android mobile based home automation using Bluetooth [3] D.JayaSree 1 M.Jhansi Lakshmi

This Project presents the overall design of Home Automation System (HAS) with low cost and wireless remote control. This system is designed to assist and provide support in order to fulfill the needs of elderly and disabled in home. Also, the smart home concept in the system improves the standard living at home. The main control system implements wireless Bluetooth technology to provide remote access from PC/laptop or smart phone. The design remains the existing electrical switches and provides more safety control on the switches with low voltage activating method. The switches status is synchronized in all the control system whereby every user interface indicates the real time existing switches status.

4. Remote Controlled Home Automation Using Android Application via WiFiConnectivity [4] Prof. Era Johri et.al.

Today is a world of advanced ubiquitous mobile applications which are used exhaustively to save time and energy. These applications ease day-to-day life of a common man. Based on these technologies and applications we designed a Home Automation System. In this paper, we propose design and prototype implementation of home automation system that uses Wi-Fi technology and Android operating system. An attractive market for Home Automation System is for busy families and individuals with physical limitations. Users can control electrical appliances in home or office via smart phone. Application will also provide secure notifications and alarm for Burglary, fire hazards and LPG leakage.This project aims at controlling every happening at home or office on your fingers.

SYSTEM ARCHITECTURE:
Home automation: circuit and working- The home automation circuit is built around an Arduinonano board,

Bluetooth module HC-05 and a 3-channel relay board. The number of channels depends on the number of appliances you wish to control. Arduinonano is powered with a 12V DC adaptor/power source. The relay module and Bluetooth module can be, in turn, powered using a board power supply of Arduinonano
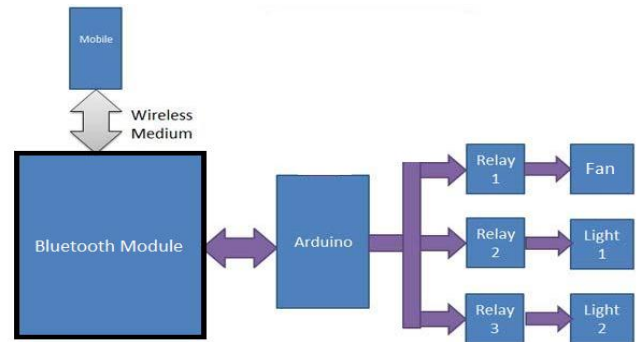

Fig.1 block diagram

RELAY: A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch. Relays are used where it is necessary to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal. Here use of this relay is to control the switching action of any electrical equipment in the circuit by giving command from controller i.e. arduino NANO.

LOAD: for this project the load is a simple or general electrical equipment's like CFL bulb, LED bulb, fan,etc. This load is always monitored by controller. By using the feedback by sensors and relays the operation of load can be control.

ARDUINO NANO: this unit is the heart of this system. It processes data from the phone and send it to user interface. This unit contain program so that our system work properly.

BLUETOOTH MODULE: A Bluetooth module HC-06 of 3.3v is used. This module works as a connector between the arduinonano and the android device. The purpose of this component is to receive the data sent by android phone over serial communication. Two types of modules are available in the market viz. HC-05 and HC-

06. We can use either of them for this purpose. However the HC-05 is cheaper than HC-06 module.

Expected Output

The project aims at designing a prototype for controlling the home appliances that can be controlled wirelessly via an application that provides the switch mode.An application is run on android device. In sync with the device.

COMPONENT DETAILS:

Arduino nano controller

The ArduinoNano is a small, complete, and breadboard-friendly board based on the ATmega328; offers the same connectivity and specs of the UNO board in a smaller form factor.The ArduinoNano is programmed using the Arduino Software (IDE), our Integrated Development Environment common to all our boards and running both online and offline.

Microcontroller:-ATmega328

Architecture:-AVR

Operating Voltage:-5 V

Flash Memory:-32 KB of which 2 KB used by bootloader

SRAM:-2 KB

Clock Speed:-16 MHz

Analog I/O Pins:-8

Bluetooth module:

The HC06 is a Serial port Bluetooth module which having fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with complete 2.4GHz radio transceiver and baseband. It uses CSR Blue core 04-External single chip Bluetooth system with CMOS technology and with AFH (Adaptive Frequency Hopping Feature).

With VCC, GND, TXD, RXD foot for the bluetooth. With LED indicator light. 3.3V LDO baseboard. Input voltage 3.3~6V, the input voltage more than 7 V is prohibited.

Unpaired current is about 30mA, matched current is about 10mA.

Relay:

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits as amplifiers: they repeated the signal coming in from one circuit and re-transmitted it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations.

5V 2-Channel Relay interface board, and each one needs 15-20mA Driver Current Equipped with high-current relay, AC250V 10A ; DC30V 10A Standard interface that can be controlled directly by microcontroller (Arduino, 8051, AVR, PIC, DSP, ARM, ARM, MSP430, TTL logic) Indication LED's for Relay output status.

ADVANTAGES AND APPLICATIONS:
ADAVANTAGES

- Automated and accurate
- Low cost
- Can be used for both remote access and monitoring.

APPLICATIONS

- Home automation
- Industries and warehouses
- Officers, Labs and workstations etc.

CONCLUSION AND FUTURE SCOPE:

This paper proposes a low cost, secure, ubiquitously accessible, remotely controlled solution for home automation. The approach discussed in the paper is novel and has achieved the target to control home appliances remotely satisfying user needs and requirements. Looking at the current scenario we have chosen Android platform so that most of the people can get the benefit. The technology is easy to use and targeted for people without technical background.

This technology also provides great assistance to handicapped and aged old people.Theproposed system is better from the scalability and flexibility point of view than the commercially available home automation systems.

This project can be further developed by integrating it with the internet to monitor your home while sitting in a remote area. By doing this, one can keep an eye on his or her home through an internet connected to the user's mobile phone or PC or laptop. The Bluetooth client was successfully tested on a mobile phones thus proving its portability and wide compatibility.

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